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THE TAXONOMY OF THE *ANOLIS HOMOLECHIS* COMPLEX OF CUBA

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No. 8 — *The Taxonomy of the Anolis homolechis Complex of Cuba*

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INTRODUCTION

In Barbour and Ramsden's (1919) "Herpetology of Cuba" nineteen species of the genus *Anolis* were recognized. Of these, five were grouped together as related, in both the key to the species and in the text. These species are: *A. homolechis* (Cope) 1864, *A. mestrei* Barbour and Ramsden 1916, *A. rubribarbus* Barbour and Ramsden 1919, *A. quadriocellifer* Barbour and Ramsden 1919, and *A. allogus* Barbour and Ramsden 1919. Later, two more species were described that were related to this group: *A. ahli* Barbour 1925, and *A. patricius* Barbour 1929. In 1937 Barbour published the "Third list of Antillean reptiles and amphibians." At this time he further emphasized the interrelation of the various species in the group by making trinomials of all names, as follows:

A. allogus allogus
A. allogus mestrei
A. allogus ahli
A. homolechis homolechis
A. homolechis rubribarbus
A. homolechis quadriocellifer
A. homolechis patricius

It must be pointed out that *A. mestrei* was described in 1916, three years before *A. allogus*. Consequently, the trinomials involving these two names are incorrect as a matter of nomenclature. Furthermore, a careful analysis of the morphology of these six described forms indicates that Barbour was also wrong in regard to the species and subspecies groupings of the various forms.

In the sections that follow an attempt is made to redescribe the forms on a sound morphological basis and to determine the interrelationship of the various species. The data for this work have been obtained by a study of the types of five of the six described forms (only the type of *homolechis* was not seen), and the specimens of these species in the Museum of Comparative

Zoology and the American Museum of Natural History, as well as the paratypes of *A. mestrei* from the United States National Museum in Washington. Further information was obtained during six weeks of field work in 1957 in the Province of Camaguey, Cuba, as well as ten weeks of field work in 1959 in Camaguey, Oriente, Las Villas, and Pinar del Rio.

THE *HOMOLECHIS* GROUP

All of the named forms here discussed can be distinguished from the other Cuban species of *Anolis* by the following complex of characters: Head scales usually keeled, with a single median keel or with two or more keels; ventral scales smooth, with a convex posterior border, and in diagonal and/or longitudinal rows; dorsals small, non-imbricate, smooth or keeled, the middorsal scales slightly larger but grading in size imperceptibly to the smaller laterals; tail laterally compressed. Frontal ridges and a sharp canthus rostralis. Marked sexual dimorphism. The females are smaller, have multikeeled head scales, the dewlap is absent or very small, and they have a different color pattern. The males are larger, have usually a single keel to the head scales, have a large dewlap, and often have a well-developed fin to the tail.

The species of this group are all forest-dwelling forms. They are customarily to be found in shaded areas but some occur in the sunnier margins of the forest.

CHARACTERS

Preserved specimens of the various species that compose the *homolechis* complex are not readily distinguishable. Scale characters can be used to separate most of the species; however, all of the scale characters are subject to considerable variation. In the field, color and pattern differences allow immediate and absolute identification of the species but these are usually destroyed or obliterated during the fixation and preservation of the animals. In the field also, the species distinctions are made more evident by the ecological separation observable between the various forms. The unravelling of the various described species in this complex has been possible only because the field work in Cuba allowed us to observe the lizards while alive.

The most useful diagnostic characters are listed and defined below:[1]

1. The number of scales that separate the supraorbital semicircles. There may be from 0-3 scales between the semicircles.

2. The type of suture between the mentals and the small postmental scales. This may be a transverse suture (Figure 6b) or the small postmentals may separate the posterior medial margins of the mentals (Figure 6a).

3. The structure of the supracarpal and supradigital scales. These scales may be smooth, have a single keel, or be multicarinate and mucronate (Figure 7).

4. The number of scales between the first canthals. This may vary from 4-12 scales. The first canthal is defined as the anteriormost enlarged and elongate canthal scale.

5. The structure of the scale anterior to the external naris. This scale may be single or divided by a median horizontal suture (Figure 8).

6. The size of the scales along the posterior border of the interparietal. These scales may be large and sharply distinguishable from the dorsals (Figure 3) or they may be small and grade into the dorsals (Figure 4).

7. The head/ear ratio as an indication of the size of the ear. The head length is measured with Vernier calipers and is the distance from the tip of the snout to the anterior border of the ear

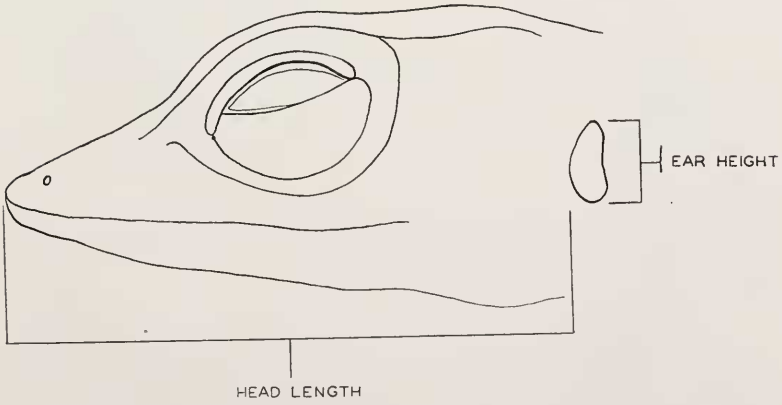

Figure 1. The head length and ear height measurements. These distances are best measured with the use of calipers.

[1] The scale terminology used is that defined by Smith (1946).

opening (Figure 1). The ear height is measured with the calipers and is the maximum distance from the ventral to the dorsal edge of the ear opening (Figure 1).

8. The body/femoral ratio as an indication of the length of the hind limbs. The body length is the snout-vent length measured with a ruler and is the distance from the tip of the snout to the vent. The femoral length is taken with a ruler and with the femoral region perpendicular to the body, and is the distance from the midventral line (pubic symphysis) to the knee (Figure 2).

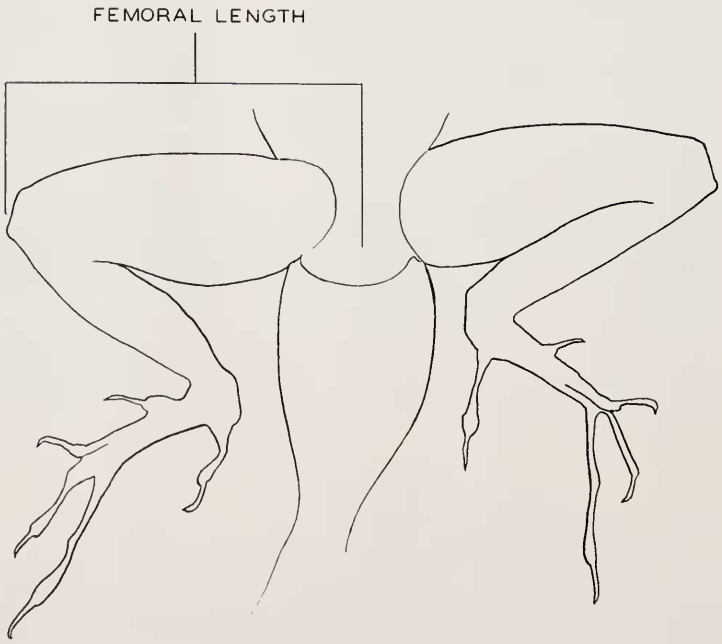

Figure 2. The femoral length measurement. The midventral point of reference is the pubic symphysis.

9. The color and pattern of the animal. The dewlap color and pattern easily distinguish the species in the field but these striking differences usually disappear or are little evident in preserved specimens. The body color and pattern are also very useful in the field; these are sometimes still evident in preserved specimens.

THE SPECIES

A definition of each of the species is provided below as well as general comments on the taxonomy, distribution, and ecology of the forms. Unless there is a statement to the contrary, all descriptions and comments are based exclusively on male specimens. In general the females of the various species can be distinguished by the same scale characters that distinguish the males, and differ also in the color pattern of the body. Except in one case all color descriptions in this paper are based on live specimens.

With the exception of *ahli*, all the species of the *homolechis* group may have high caudal fins in the males. This, however, is a variable character and often, within a single population, some males are devoid of a caudal crest while others have the crest well developed. The few (12) males of *ahli* that we have seen lacked a caudal fin.

The list of the localities for the species is given at the end of the text. The data were obtained from the specimens in the American Museum of Natural History, the Museum of Comparative Zoology, and the United States National Museum.

Anolis allogus Barbour and Ramsden

A. allogus Barbour and Ramsden, 1919.
A. allogus allogus, Barbour, 1937.
A. abatus Ahl, 1924.

Type locality. Bueycito, S. of Bayamo, Oriente, Cuba.

Definition. Supraorbital semicircles separated by two scales (Figures 4 and 9); a transverse suture between the mental and postmentals (Figure 6b); supracarpal and supradigital scales multicarinate and mucronate (Figure 7b); usually with 7-9 scales between the first canthals (Figure 10); scale anterior to the naris divided by a horizontal suture (Figure 8); scales around the posterior margin of the interparietal small and grading into dorsals (Figure 4). The body/femoral ratio averaging 3.3 (Table 1); the head/ear ratio averaging 6.2 (Table 2). Maximum snout-to-vent length: ♂, 58 mm., ♀, 41 mm.

Body color of ♂ ♂ in life with reddish and yellow reticulations. Color may change from a pale pink or tan to a very dark red-brown. Yellow reticulations usually prominent when in dark color phase. Tail is usually redder than the body. Iris metallic blue or grey. Usually some evidence of four dark

chevrons on dorsum. Dewlap ground color ranging from light yellow to apricot with 3-4 reddish stripes and a white margin (Figure 11).

The females have a wide middorsal light stripe (tan or yellow in color) while the dorso-lateral areas are a darker brown color. The middorsal stripe may have a scalloped margin and in a few specimens evidence of diamond-like markings in the light stripe may be seen.

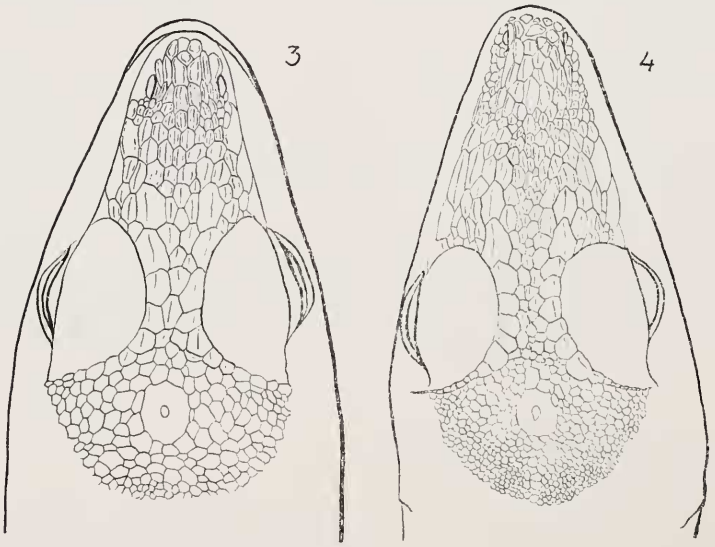

Figure 3. Dorsal view of the head of *Anolis homolechis.*
Figure 4. Dorsal view of the head of *Anolis allogus.*

Taxonomy. We have examined the type specimen of *Anolis abatus* Ahl and regard it as synonymous with *allogus.*

Our description of *allogus* differs from the color description provided by Barbour and Ramsden. They describe the body color as brown to black and the dewlap as yellow with a carmine spot. To resolve this discrepancy a collecting trip was undertaken to the type locality in the northern foothills of the Sierra Maestra. There is no longer any forest in the vicinity of Bueycito and it was necessary to travel farther into the foothills to Buey Arriba (8 km. south of Bueycito) to find forest and collect the species. The specimens from Buey Arriba have a yellow-tan

dewlap with three bright red stripes, and the body color is reddish as described above for the species. We feel that the color description of Barbour and Ramsden is probably erroneous. The red stripes in *allogus* are not sharply demarcated and

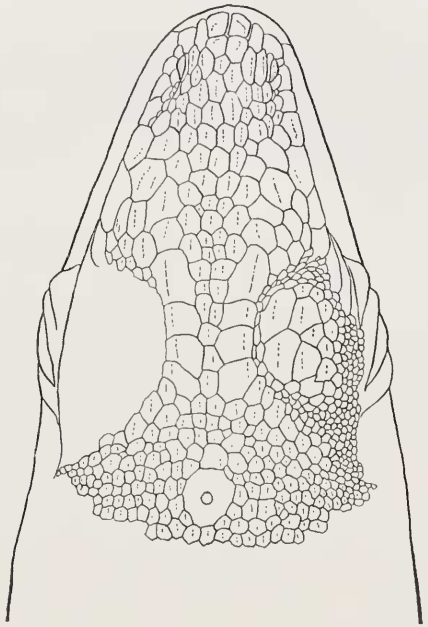

Figure 5. Dorsal view of the head of *Anolis mestrei*.

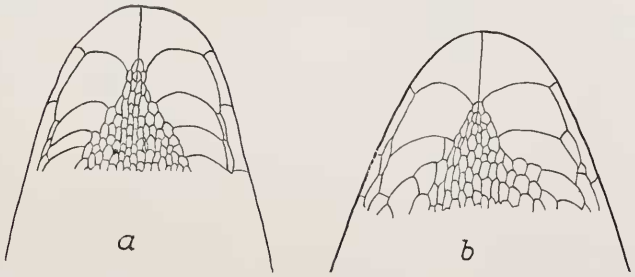

Figure 6. Ventral view of the chin showing the diagnostic postmental scales. (a) *A. homolechis;* (b) *A. allogus*.

often are very near to each other. In alcoholic specimens the three or four separate stripes often appear confluent. In all other respects the type specimen and the other specimens that Barbour ascribed to *allogus* are in agreement with our description.

Distribution. This species is recorded from all of the provinces except Matanzas and Las Villas; it is also absent from the Isla de Pinos (see Figure 13). The lack of records from Matanzas and from the portion of Las Villas outside the Sierra de Trinidad may be the consequence of insufficient collecting in these areas, or agriculture may have destroyed the natural habitat of the species.

Variation. There is no evidence of any significant geographic variation. The color and pattern of the dewlap is variable (see Figure 11) but we do not consider the variants well enough defined to merit taxonomic recognition. At Buey Arriba in Oriente the two or three red stripes are bright red, while in many of the Camaguey specimens the stripes are often very faint and of an orange color. Specimens may show from two to four stripes. In Pinar del Rio the background color is apricot while in most of the other localities it is best described as yellowish or tan.

Some of the specimens from Oriente Province (Baracoa, coast south of Pico Turquino, mountains north of Imias) though not distinguishable from *allogus* by any scale characters, show a general pigmentation pattern that differs from that of other Oriente *allogus*. As preserved, these specimens are devoid of a body pattern and show a pale body coloration (tan) and a dark dewlap. It is, of course, not improbable that the mountainous areas of Oriente will prove to have forms related to *allogus* that are distinguishable only by the dewlap or body color (as are *ahli* and *rubribarbus*). Isolation of populations in the various valleys and ranges of Oriente would permit the evolution of distinct forms. However, the detection and recognition of such forms requires detailed data from the living animals.

Ecology. The ecology of this species is discussed in some detail in Ruibal (1961). It is a forest-dwelling species restricted to the cooler, deeply-shaded portions of the broadleaf forests, perching on small tree trunks a few feet from the ground. Characteristically not a shy species, it will usually allow the collector to approach within a foot before escaping by running down to the base of the trunk or to the ground.

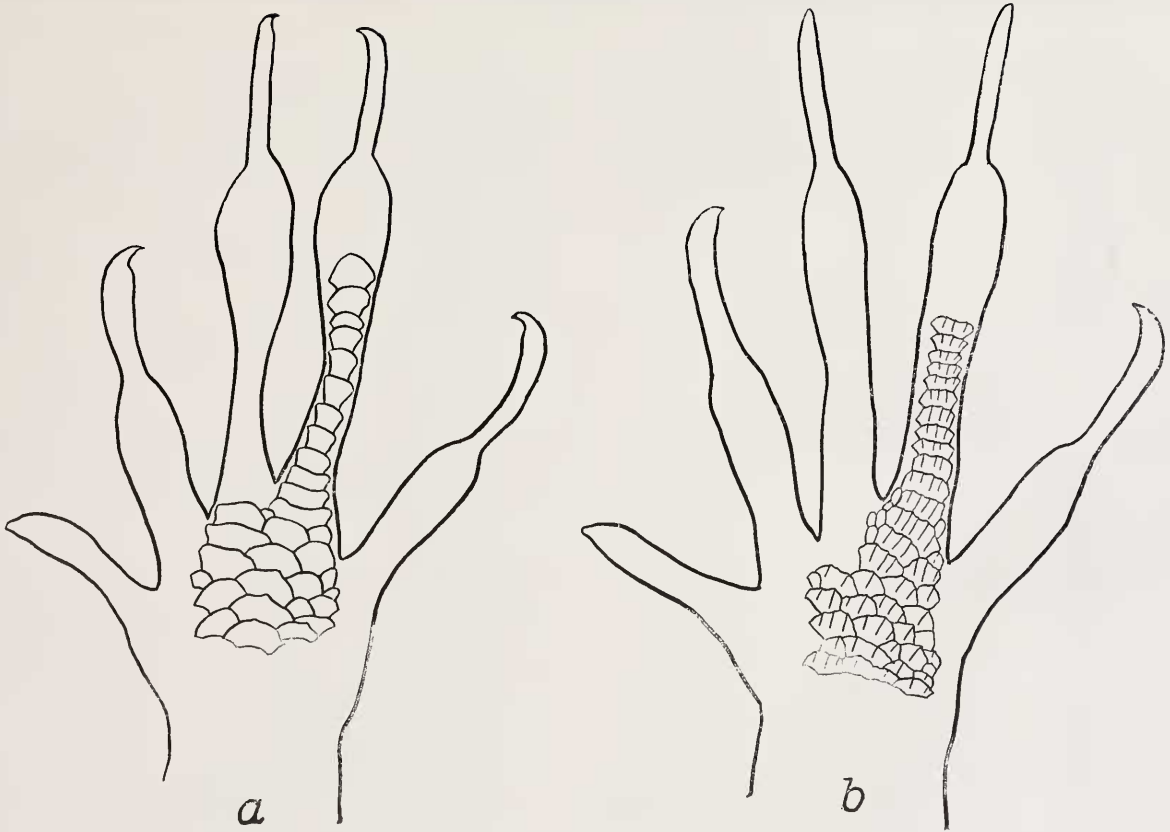

Figure 7. The supracarpal and supradigital scales of (a) *A. homolechis* and (b) *A. allogus*.

TABLE 1. THE BODY/FEMORAL RATIO OF THE SIX SPECIES

The values for *homolechis* and *allogus* include samples from Pinar del Rio, Camaguey and Oriente. The range for each species is in parentheses below the mean.

Species	*N*	*Mean*	σ	σM
homolechis	169	3.6 (3.1–4.0)	.16	.01
allogus	96	3.3 (3.0–3.8)	.21	.02
ahli	11	3.3 (3.0–3.6)	.16	.05
rubribarbus	17	3.3 (2.7–3.6)	.15	.04
mestrei	24	3.2 (2.9–3.5)	.15	.03
imias	1	3.1	—	—

TABLE 2. THE HEAD/EAR RATIO OF THE SIX SPECIES

The values for *homolechis* and *allogus* include samples from Pinar del Rio, Camaguey and Oriente. The range for each species is in parentheses below the mean.

Species	*N*	*Mean*	σ	σM
homolechis	162	7.7 (6.0–9.7)	.45	.04
allogus	100	6.2 (4.9–8.2)	.70	.10
ahli	12	6.3 (5.7–6.8)	.38	.11
rubribarbus	17	7.6 (6.3–8.6)	.75	.18
mestrei	20	8.5 (6.2–9.7)	.87	.20
imias	1	6.0	—	—

The females appear to be more terrestrial than the males, and are often found in the leaf litter on the floor of the forest and at the base of the small trees.

This species is absent from the coastal forests, savannas, pine forests, and from agricultural areas. We have never observed it near human habitations or in gardens.

Previous to the destruction of the Cuban forest, *allogus* was probably a widespread and common species. With the destruction of its natural habitat this species is now restricted to the small patches of dense forest that remain on the island. It has been collected at many localities in the Sierra Maestra and as high as 4000-6000 feet on Loma Cordero near Pico Turquino.

The apparent absence of *allogus* from the Isla de Pinos (where *homolechis* is found) may be the result of the specialized ecological requirements of this species for deeply-shaded, cool forests. The forests of Isla de Pinos may not be dense enough to provide this type of habitat. Furthermore, over-water invasion of the Isla de Pinos is hampered by the low thermal tolerance of *allogus*.

Anolis ahli Barbour

A. ahli Barbour, 1925.
A. allogus ahli, Barbour, 1937.

Definition. The scalation of this species cannot be distinguished from that of *A. allogus*. The body/femoral ratio and head/ear ratios are also identical to *allogus* (see Tables 1 and 2). The maximum snout-to-vent length: ♂, 58 mm. and ♀, 43 mm.

The body color of this species usually shows a greenish cast and the general color may shift from tan to dark brown. A common body pattern is a "salt and pepper" speckling. Usually four dark saddle markings are visible on the dorsum. The iris is blue. The dewlap has a large red spot that is surrounded by a yellow-white area (Figure 11).

Taxonomy. In the 1937 checklist, Barbour placed this form under *allogus* as a subspecies. The two forms are allopatric; the nearest recorded locality for *allogus* is at the Loma de Cunagua in western Camaguey. We have been conservative in utilizing the trinomial and prefer to view *ahli* as a full species. The lack of scale character differences between *ahli* and *allogus* does not prevent their being considered full species: the body

color and dewlap color pattern sharply distinguish the two forms. Color patterns are certainly as "important" as scalation in distinguishing species.

Distribution. This species is known only from the Sierra de Trinidad in Las Villas.

Ecology. This species has been collected in the darkest, shaded parts of the forest in the Sierra de Trinidad. It perches a few feet from the ground on tree trunks. It is a shy species and usually will run to the base of the trunk or to the ground on the approach of a collector. It is often difficult to distinguish the lizards from the background in the dim light of the forest. It appears to be the ecological equivalent of *allogus* in the Sierra de Trinidad.

Hardy (1958) has described the use of the tail by this species as a prehensile organ. We have observed that all of the species of the *homolechis* complex can curl the tail laterally into a tight whorl. We have, however, failed to observe any actual prehensile use of the tail. As mentioned previously, this species is the only one of the *homolechis* group in which no males have been observed with well developed caudal crests.

Anolis rubribarbus Barbour and Ramsden

A. rubribarbus Barbour and Ramsden, 1919.
A. homolechis rubribarbus, Barbour, 1937.

Type locality. Puerto de Cananova; near Sagua de Tanamo, Oriente, Cuba.

Definition. The scalation of this species is the same as that of *allogus* except for the structure of the scale anterior to the naris. In most specimens of *rubribarbus* this is a single scale that extends from the margin of the nares to the rostral (Figure 8).

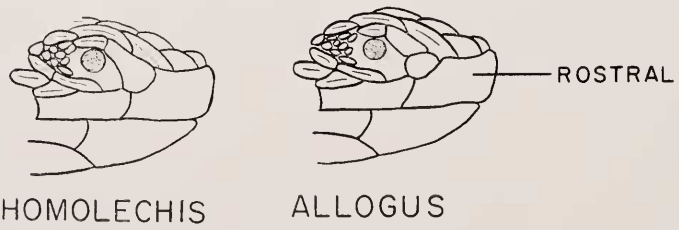

Figure 8. The structure of the scale anterior to the external naris in *A. homolechis* and *A. allogus.* In *A. rubribarbus* the scale is usually single as in *A. homolechis.*

In *allogus* and *ahli* this scale is divided by a horizontal suture. The body/femoral ratio averages 3.3 and is identical to that of *allogus* (Table 1). The ear is smaller than that of *allogus* or *ahli* and the head/ear ratio average is 7.6, very close to that of *homolechis* (Table 2). The maximum snout-to-vent length: ♂, 62 mm., ♀, 42 mm.

The general body color of this species is usually grey. It ranges from a pale grey to an almost black ground color. Yellow spots and reticulations may be present on the sides. The body may show no pattern with only a pale grey color or a "salt and pepper" marking. However, the most characteristic color phase is a pattern of dark (blackish) vertical bands separated by lighter (yellowish or grey) bands (see Figure 14). In this phase there are about six vertical bands on the body and more on the tail. The limbs are also banded. The dark body bands are usually narrower in the middorsal area and widen laterally, while the lighter bands show the reverse. The iris is blue-grey. This species has the most brilliant and distinctive dewlap pattern of any of the Cuban anoles (Figure 11) — 4-5 thin red stripes on a deep yellow ground. The scales along the edge of the dewlap are large and white and provide a white margin to the dewlap. The scales on the inner portions of the dewlap are smaller and black. The chin has well-marked dark reticular markings.

We have no color data on the female specimens of *rubribarbus*.

Taxonomy. This species was erroneously considered a subspecies of *homolechis* by Barbour. *Rubribarbus* is actually closely related to *allogus*, and museum specimens are difficult to distinguish from *allogus*: the undivided character of the scale anterior to the nares serves to separate most specimens of *rubribarbus* when color is absent. This species is further distinguishable from *allogus* by the smaller ear opening. However, there is considerable overlap in the latter character and it is therefore not very useful in practice. Some color characters, however, assist in identifying preserved specimens, e.g., the presence of darkly pigmented scales at the base of the dewlap of *rubribarbus*. This usually appears as a dark area in the throat of specimens. In *allogus* usually no dark pigment is visible in the throat. In those specimens of *allogus* that demonstrate a dark throat the pigment is between the scales rather than in the scales as in *rubribarbus*. Some specimens of *rubribarbus* also show

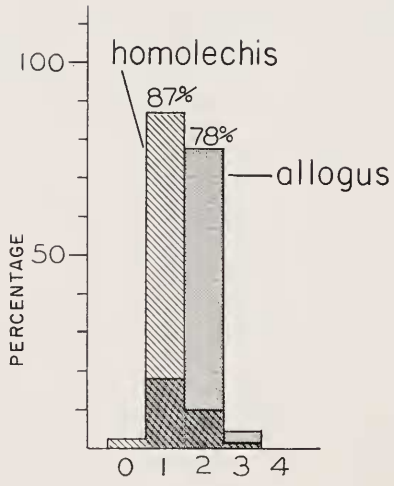

Figure 9. Histograms of the number of scales between the supra-orbital semicircles of *allogus* and *homolechis*. The great majority of the specimens of these two species are distinguishable by this character.

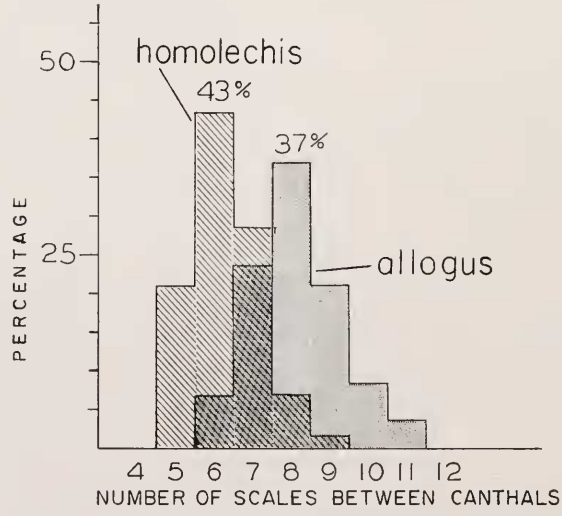

Figure 10. Histograms of the number of scales between the canthals in *homolechis* and *allogus*. There is considerable overlap between the specimens of these two species.

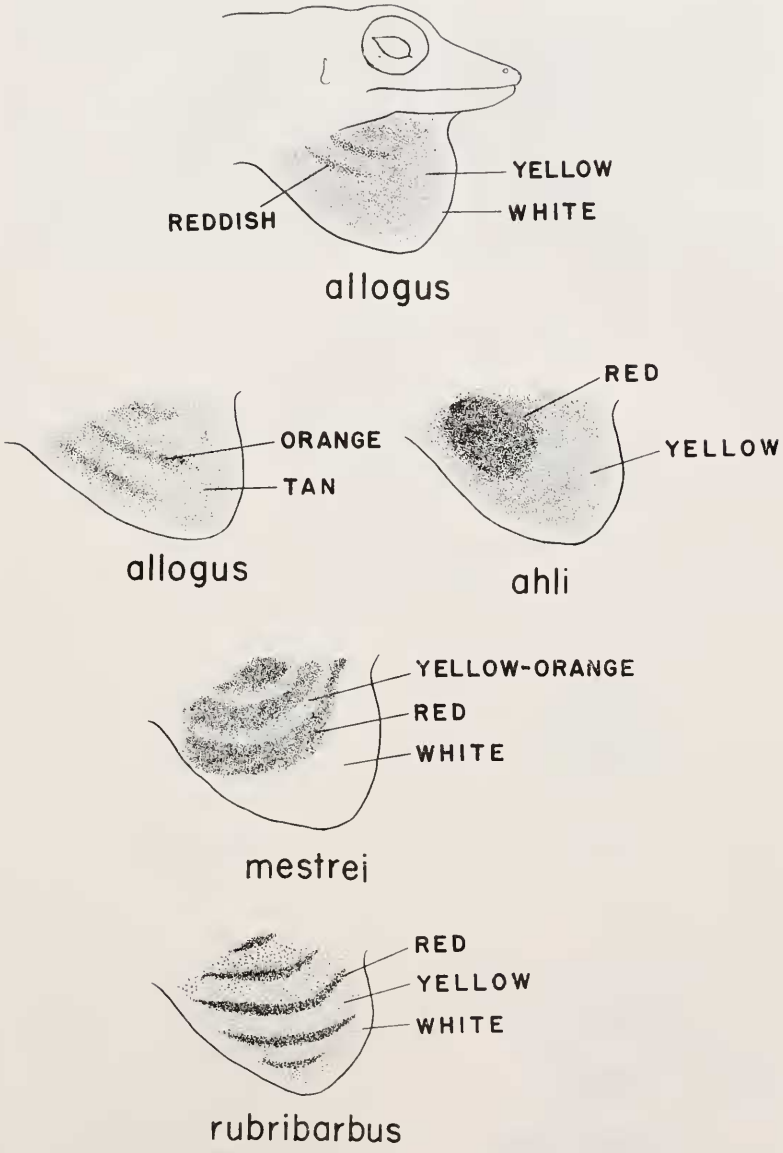

Figure 11. Diagrams of the dewlap pattern and color of *A. allogus, ahli, rubribarbus,* and *mestrei.*

indications of the dark vertical body stripes which are not present in *allogus*. Also of value in distinguishing *rubribarbus* are the well-marked reticulations on the chin.

In their description (Barbour and Ramsden, 1919), the authors listed M.C.Z. 11941 as the number of the type specimen and gave M.C.Z. 11868 as the number of the paratype (and of the specimen figured in plate 9). There is an evident lapsus since M.C.Z. 11868 is the actual type specimen, while the number 11941 belongs to a specimen of *Platysaurus capensis* from Rhodesia.

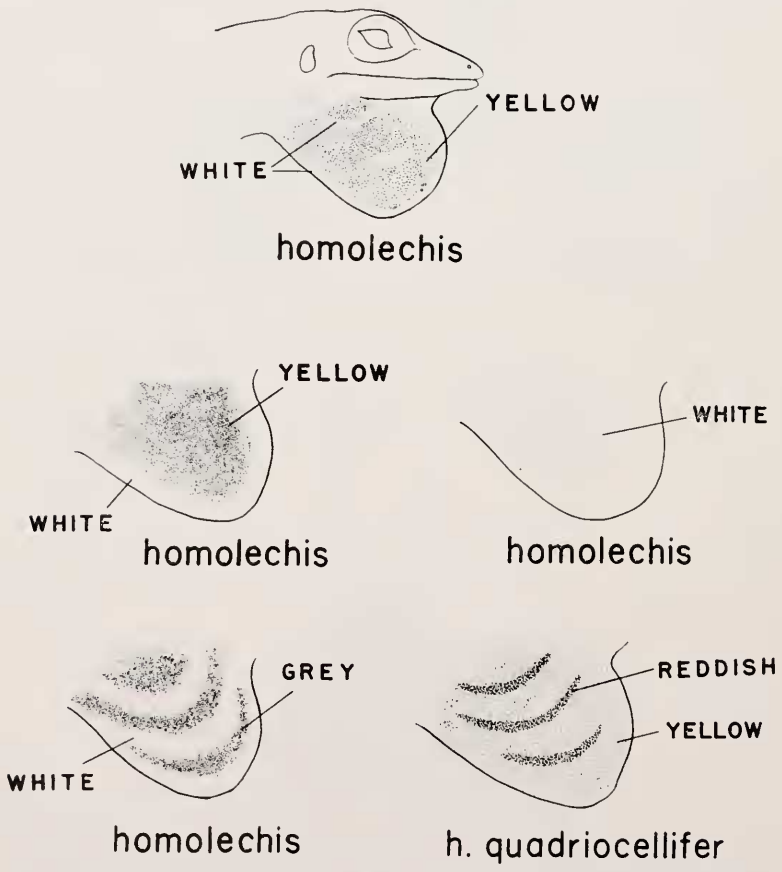

Figure 12. Diagrams of the dewlap pattern and color of *A. homolechis*.

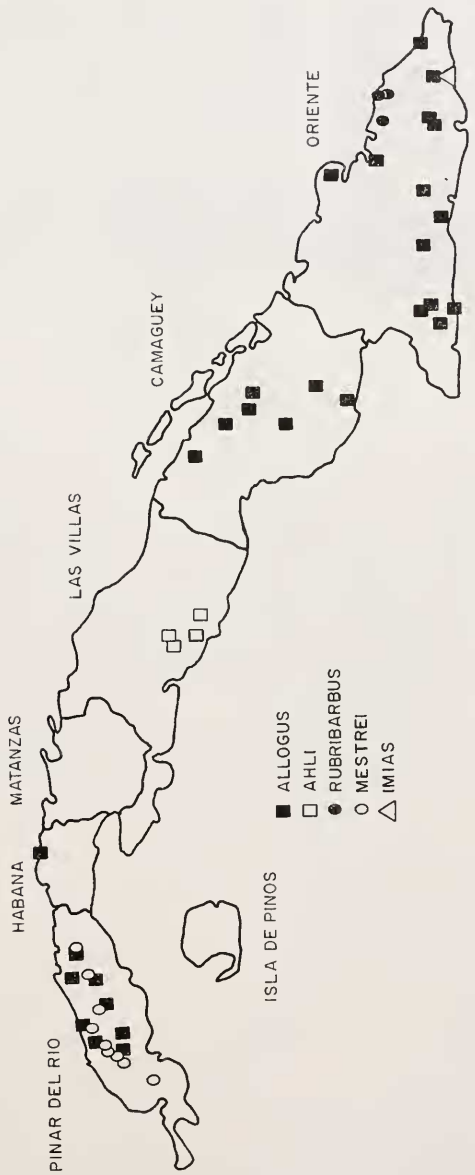

Figure 13. Map of the distribution of *A. allogus, ahli, rubribarbus, mestrei,* and *imias,* sp. nov.

Distribution. This species is allopatric to *allogus*. *Rubribarbus* is so far known only from the northeast coast of Oriente, from Cananova to Punta Gorda to the east of Moa (Figure 13).

Ecology. We have collected this species to the east of Moa in the broad leaf gallery forests that extend along the streams and

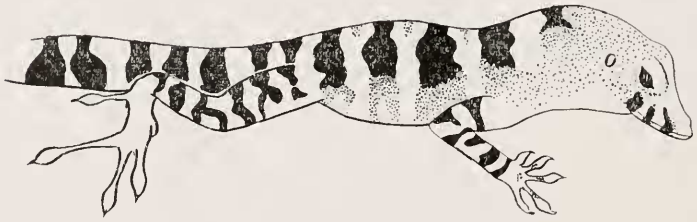

Figure 14. Diagram of the distinctive dark banding of *A. rubribarbus*.

rivers that deseend through the coastal pine forests. We have also collected it in the cooler broad-leaf forests southeast of Moa at an elevation of about 1000 feet. It is a forest-dwelling species but does not appear to be restricted to the deep shaded portions of the forest as are *allogus* and *ahli*. It is a shy species and difficult to observe against the greyish bark of some of the trees. It perches head down a few feet from the ground in the same fashion as the other species.

It is very probable that this species may no longer exist in the vicinity of Cananova, the type locality. We visited this locality briefly in 1959 and were unable to find forests to collect in.

Anolis homolechis (Cope)

Xiphosurus homolechis Cope, 1864.
Anolis homolechis, Boulenger, 1885; Barbour, 1914; Barbour and Ramsden, 1919.
A. calliurus Ahl, 1924.
A. muelleri Ahl, 1924.
A. cubanus Ahl, 1925.
A. patricius Barbour, 1929.
A. homolechis homolechis Barbour, 1937.
A. homolechis patricius Barbour, 1937.
A. quadriocellifer Barbour and Ramsden, 1919.

Type locality: "West Indies." It would be reasonable to restrict the type locality to Habana, Habana Province, Cuba. The

populations in the vicinity of the city of Habana have a pure white dewlap.

Definition. Supraorbital semicircles separated by a single scale (Figures 3 and 9); posterior medial margins of the mentals separated by small postmentals (Figure 6a); supracarpal and supradigital scales usually smooth or with a single keel (Figure 7a); usually 5-7 scales between the first canthals (Figures 3 and 10); a single undivided scale anterior to the nares and in contact with the rostral (Figure 8); scales along the posterior margin of the interparietal large and sharply demarcated from the

Figure 15. Dorsal pattern of the female specimens of *A. homolechis.* In life the pattern is composed of black and various shades of brown.

dorsals (Figure 3). The body/femoral ratio averages 3.6; the head/ear ratio averages 7.7 (Tables 1 and 2). The maximum snout-to-vent length: ♂, 56 mm., ♀, 43 mm.

The general body color ranges from a very light tan, through brown, to black. Usually there is some evidence of horizontal stripes on the lateral surface of the body, and of four dark chevrons on the dorsum. Yellow markings may be present laterally. The iris is gold or metallic brown in color. The dewlap color of this species is very variable (Figure 12) and is discussed below in detail.

The female color pattern usually consists of a series of light colored diamonds on the dorsum (Figure 15). The general color may change from tan to black. The ventral surface is sometimes yellow in females.

Taxonomy. We have examined the types of the three species described by Ahl (*calliurus, muelleri,* and *cubanus*) and consider them synonymous with *homolechis.* We have also examined the type of *A. patricius* Barbour from Mina Piloto in Oriente and find no character to distinguish this form from *homolechis.* The type locality of *patricius* is in the municipality of Sagua de Tanamo but we have been unable to locate Mina Piloto precisely. No information about the dewlap color was provided in the description of the type. The *homolechis* from the town of Sagua de Tanamo and nearby Cananova have a white dewlap.

In the 1937 checklist, Barbour included *A. quadriocellifer* from the Ensenada de Cajon, Cabo San Antonio, at the extreme western end of Cuba, as a subspecies of *homolechis.* We have examined the types as well as additional specimens from the type locality collected by Albert Schwartz. This form is readily distinguishable from the other populations of *homolechis* by the light-margined, dark ocellus above the foreleg (Figure 16), and

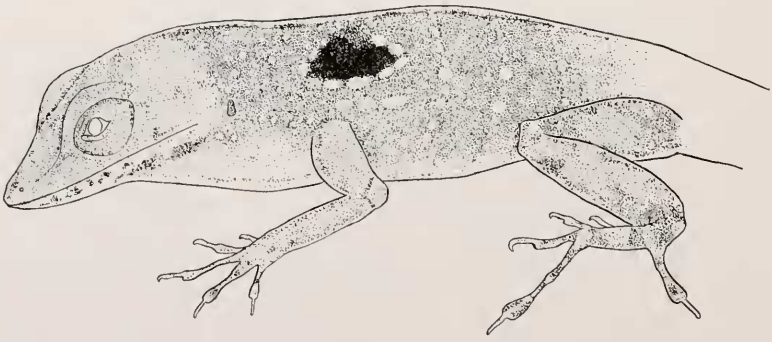

Figure 16. The lateral pattern of a male specimen of *A. homolechis quadriocellifer* (M.C.Z. 11907) from Ensenada de Cajon, Pinar del Rio.

the yellow dewlap with three reddish stripes (Figure 12). The juvenile as well as female specimens of *quadriocellifer* have a well-marked lateral ocellus. We agree with Barbour in considering this form a subspecies of *homolechis*. We have reached this decision from a consideration of the morphology of the populations near the Ensenada de Corrientes as represented by specimens collected by Albert Schwartz and his staff. (The localities are shown on map of Figure 17.)

The Ensenada de Corrientes is midway between Cabo San Antonio, the type area for *quadriocellifer*, and the towns of Cayuco and Isabel Rubio (formerly Mendoza) in the vicinity of which typical white dewlap *homolechis* has been collected.

Specimens from Ensenada de Corrientes have a yellow dewlap and have white spots on the sides of the body that resemble the light-colored margins of the *quadriocellifer* ocelli. Specimens of *quadriocellifer* have most of the supracarpal scales with two or three keels. Specimens from the Ensenada de Corrientes have most of these scales with only one or two keels, and two of the specimens (of a total of 23 males examined) have all the supracarpal scales smooth. Specimens from the vicinity of Cayuco and Isabel Rubio have the supracarpal scales with only a single keel or smooth.

On the basis of these characters we infer that typical *quadriocellifer* from Cabo San Antonio is connected to "typical" *homolechis* from southern Pinar del Rio by an intermediate population (only adult males used in the comparison) as shown in the following table:

quadriocellifer (8 specimens)	Populations from Ensenada de Corrientes (23 specimens)	*homolechis* (14 specimens from SW of Cayuco)
a) Yellow dewlap with red stripes.	a) Yellow dewlap.	a) White dewlap.
b) White-margined lateral ocellus.	b) Lateral white spots.	b) No white spots.
c) Supracarpals usually with 2-3 keels.	c) Supracarpals usually with 1-2 keels.	c) Supracarpals usually with 0-1 keel.

Four of the specimens (representing the three localities listed in the above chart) were unique for *homolechis* in having the ventrals with slight keels.

Variation. No geographical variation was found in the scalation of this species. However, there is a pronounced variation in the color and pattern of the dewlap. The majority of the populations of *homolechis* throughout the island and the Isla de Pinos have a white dewlap. The dewlap may be pure white showing only a faint indication of black pigment or there may be two or three grey stripes on a white background (Figure 12). Both these types show no systematic geographical distribution and may actually be found in the same population. The populations showing these two white patterns may best be referred to as the "white dewlap" form. Another group of variations may be called the "yellow dewlap" form. We have personally seen this form from the Sierra de Cubitas, the shores of the Bahia de Nuevitas, and along the north coast at the Playa Santa Lucia (east of the Bahia de Nuevitas) all in the Province of Camaguey. The Sierra de Cubitas population has a yellow dewlap with a broad white margin (Figure 12). The populations from the vicinity of the Bahia de Nuevitas and Playa Santa Lucia have a deeper yellow or orange color, a narrow white margin, and one or two stripes of white or light yellow (Figure 12). The two yellow dewlap populations are therefore distinguishable. We do not know if these two populations are isolated from each other or not. However, it appears probable that they are separated by the savanna that extends north to the coast near the Rio Maximo.

P. J. Darlington has also recorded yellow (and/or orange) dewlap *homolechis* from the south coast of Oriente near Pico Turquino, Cabo Maisi, and the lower Rio Ovando. Albert Schwartz has also collected the yellow dewlap form along the south coast of Oriente from just north of Cabo Cruz to Playa Juragua, east of Siboney. Yellow dewlap forms have also been recorded at Banes on the north shore of Oriente, and of course the previously mentioned population from the Ensenada de Corrientes in Pinar del Rio has a yellow dewlap. We cannot compare the color patterns of these populations with those of the Camaguey yellow dewlap populations because we have not seen the former in life, and beyond the fact that they are yellow we do not know the details of the pattern.

The map (Figure 17) indicates the known distribution of the white and yellow dewlapped forms. There is an apparent gap in the distribution of the coastal yellow dewlap in southern Oriente between Cabo Maisi and Playa Juragua. In this zone

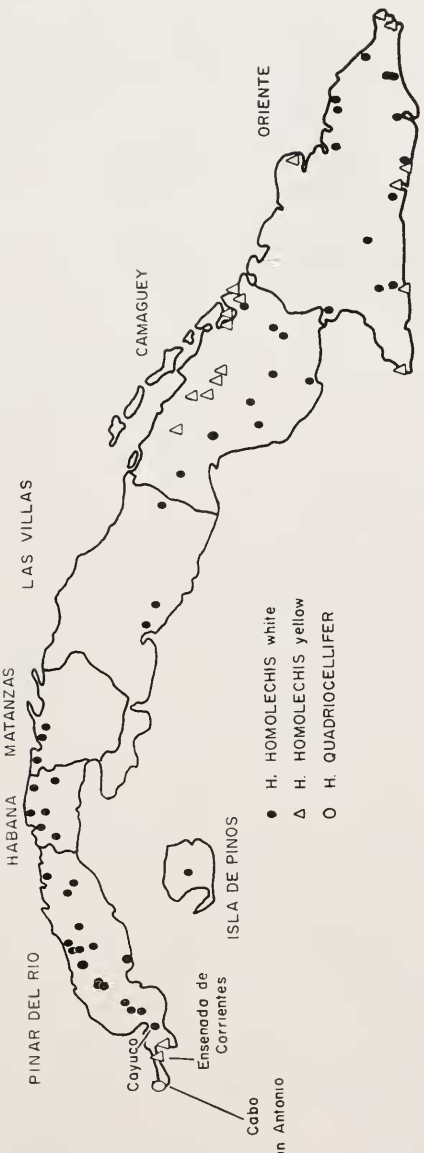

Figure 17. Map of the distribution of the various forms of *A. homolechis*.

white dewlapped forms have been collected. Similarly, there is an apparent gap on the north coast of Oriente. As mentioned above there is also a gap between the yellow forms of the Sierra de Cubitas and the yellow forms of Playa Santa Lucia in Camaguey. For the moment we believe it prudent to refrain from designating these populations as subspecies or species. With the exception of the Sierra de Cubitas population all of the other yellow forms are coastal. The coastal forests are usually drier and warmer than the more inland forest and the yellow forms may represent a *homolechis* ecotype adapted to the more stringent conditions of the coastal areas. Collecting in the coastal forest in other parts of the island may prove that the yellow form is more widespread than the present data indicate.

We have studied the contact of the yellow and white forms near the Playa Santa Lucia, Camaguey. The senior author undertook field work in this area in 1957 (Ruibal, 1958) and both of us visited the area in 1959. A road runs inland from the beach at Sta. Lucia in a southwesterly direction. Collections were made at various stations along this road from the beach to 21 kilometers inland. At the shore the vegetation is a coastal thicket predominantly made up of seagrape (*Coccoloba*) and a small palm (*Coccothrinax* sp.). A few kilometers inland, broadleaf forest is found on limestone. Some of the forest is in relatively good condition, having only been "highgraded;" other parts have been severely cut for charcoal. Some tongues of mangrove extend into the forest. At about 20 kilometers inland there is only a sparse open forest with very few large trees. Cattle are grazed in the area and most of the vegetation here is "mije" (*Eugenia*), an arborescent cactus (*Dendrocereus*), and numerous species of palms. A total of four visits were made to Santa Lucia to sample the populations. From the thicket on the shore to 12 km. inland only yellow *homolechis* were collected. From 13 km. to 17 km. inland, about 25 specimens of the white dewlap form have been collected, yet within this same area (at the 15 km. and 17 km. stations) two specimens of the yellow form have also been found. From the 18 km. to 21 km. stations only white forms were found. This transition of yellow forms on the coast and white forms further inland is similar to the situation that P. J. Darlington found along the south coast of Oriente where he collected both forms of *homolechis*, the yellow near the coast

and the white inland. No "intermediate" specimens between the two forms have been found in the Sta. Lucia area.[2] The amount of field work done at Sta. Lucia was limited and we did not obtain any ecological or behavioral data on the two forms. As mentioned above, the yellow and white forms of *homolechis* are best left, for the time being, without any taxonomic designation. It is to be hoped that in the near future a more precise study can be made of this interesting problem.

Ecology. Some aspects of the ecology of this species are discussed in Ruibal (1961). In the province of Camaguey this species is restricted to the margins of the broadleaf forests. It is customarily found in areas of filtered sunlight — along paths, small clearings, and the edges of the forests. However, it is found throughout the drier and sparser coastal broadleaf forest where *allogus* is absent. It is also found in the palm-pine savannas in northern Oriente. In Camaguey this species is never found near human habitations or in agricultural areas. In contrast, at Sagua de Tanamo in Oriente, *homolechis* is an abundant lizard of the fence posts around houses and pastures. It occupies the same fence posts with *A. sagrei* and *A. porcatus*. Similarly, near Habana we have observed *homolechis* in gardens. In Las Villas we have had little experience with the species but we always found it in forests or in the vicinity of forests. It is interesting that the restriction of *homolechis* to forest habitats in central Cuba may be correlated with the presence of *A. allisoni* (Ruibal and Williams, 1961) around human habitations in central Cuba. It may be that in eastern and western Cuba *homolechis* can occupy the area around human habitations because *allisoni* is absent (in these areas *porcatus* replaces *allisoni* [see Ruibal and Williams, *op. cit.*]).

Male specimens of *homolechis* are characteristically found perched head down on small tree trunks a few feet off the ground. The tail is often curled laterally. The females are more terrestrial and are usually on the ground or on perches closer to the ground than the males.

This species is found throughout the forests of the Sierra Maestra and has been collected as high as 5900 feet at Palma Mocha, near Pico Turquino.

[2] One specimen collected at 12 km. from the beach in 1957 had a red ground color to the dewlap and yellow stripes.

Anolis mestrei Barbour and Ramsden

A. mestrei Barbour and Ramsden, 1916.
A. allogus mestrei, Barbour, 1937.

Type locality. Valle de Luis Lazo, Pinar del Rio, Cuba.

Definition. Except for one character, we have been unable to successfully distinguish the scalation of this species from that of *homolechis*: Specimens of *mestrei* have small granular posterior supraciliaries while most *homolechis* have larger, elongate, and keeled posterior supraciliaries. This character is variable, however, often subjective, and difficult to use. *Mestrei* further differs from *homolechis* in having longer hind legs, the body/femoral ratio averaging 3.2 (Table 1) and a smaller ear opening, the head/ear ratio averaging 8.5 (Table 2). The maximum snout-to-vent length ♂, 55 mm., ♀, 44 mm.

The body color of this species varies from dark to light grey with an overall greenish cast. Yellow or orange spots are present over the body. The iris is yellowish. The dewlap has a dark red basal spot with two yellow-orange stripes. The remaining broad margin is white (Figure 11). The scales on the dewlap are white.

The females show the same general body color but can also shift to a light brown color. There are darker hour-glass shaped markings on the dorsum. The females have a small apricot colored dewlap.

Taxonomy. An examination of the type and paratypes has revealed that two species were confused in the original description. The type (M.C.Z. 11285) and paratypes (M.C.Z. 11286, U.S.N.M. 26731 and 26733) are *mestrei* while two other paratypes (U.S.N.M. 26732 and 26344) are actually specimens of *allogus*.

Barbour was in error in making *mestrei* a subspecies of *allogus* in the 1937 checklist. *Mestrei* is readily distinguishable from *allogus* by many scale and color differences. In the limestone hills of Pinar del Rio the two species are sympatric.

Preserved specimens of *mestrei* are very difficult to distinguish from *homolechis*. Usually there is a dark basal portion to the dewlap in preserved specimens of *mestrei*. The superciliaries, the length of the hind limbs, and the smaller ear opening will also assist in distinguishing specimens. The ear opening in *mestrei* is not only smaller (in height) but is also differently shaped than in *homolechis*. In *mestrei* the opening is circular while in *homolechis* it is higher than wide. This is readily apparent in

the comparison of the ear height/ear width ratio of the two species:

	homolechis (15 specimens)	*mestrei* (15 specimens)
Mean	1.59	1.03
Range	1.2-2.1	0.9-1.4

Distribution. This species is restricted to the broadleaf forests of the limestone mountains and hills of Pinar del Rio — the Sierra de los Organos and the Sierra del Rosario.

Ecology. We have observed this species in a forest in a small "mogote" near Sumidero. Here *mestrei* was found throughout the forested portion of the mogote. The females and juveniles were on the ground or on the boulders of limestone that covered much of the forest floor. The adult males appear to be restricted to the limestone or were found on fallen logs near the limestone outcrops. In no instance did we find the *mestrei* perched head down on vertical tree trunks in the manner of *allogus* and *homolechis*. The lizards would escape by running to the ground and hiding, or by entering crevasses in the limestone. We started collecting at this locality at 8:00 in the morning and during the early part of the morning only juveniles and females were seen, and it was not until near noon that we observed the adult males. This species appears to be restricted to the shaded portions of the forest and only in a few instances was it found in areas of filtered sunlight.

Anolis imias, sp. nov.

Type: M.C.Z. 42556, adult male, collected east of Guantanamo Bay at Imias, on the south coast of Oriente Province, Cuba, in August 1936, by P. J. Darlington.

Paratype. M.C.Z. 42555, adult female having the same data as the type.

Diagnosis. Similar to *A. homolechis* but differing from that species in having smooth brachial scales, smooth supraoculars, larger ear opening, longer hind limbs, the gulars bordering the mental along a transverse suture, and a brown dewlap.

Description of type. Head. Most of the head scales smooth, the anterior-most scales with blunt keels. Six scales across the snout between the first canthals. A frontal depression and weakly developed frontal ridges. Nostril separated from the

rostral by two scales on the right side and by one scale on the left side. Seven scales bordering the rostral posteriorly. Supraorbital semicircles separated from each other by a single row of small scales. Supraoculars irregular in shape, smooth, and separated from the supraorbitals by a row of scales. Canthus well-marked. Four rows of loreals below the second canthal. Suboculars keeled and in contact with the supralabials. The subocular ring is continuous with a group of slightly enlarged postoculars. Eight supralabials. A large interparietal with no evidence of a parietal eye. Parietal region in a depression demarcated posteriorly by the V-shaped ridge of the underlying parietal bone. Postparietal scales large and sharply demarcated from dorsals. Temporals small, the upper temporals forming a longitudinal zone of scales larger than the granular lower temporals and larger than the scales between the upper temporals and the parietals. Ear opening vertically elongate.

Mental longitudinally divided, bordered along a straight transverse contact by four small gulars. The mental is also bordered posteriorly by a pair of sublabials and infralabials. Throat and chin scales smooth. Dewlap large and with smooth scales.

Body. Middorsal scales keeled and larger than the lateral granular scales, but not sharply demarcated. Ventrals smooth, imbricate, with a convex posterior margin, and in longitudinal and diagonal rows.

Limbs. Humeral scales with weak keels, but the larger brachial scales are smooth. Hind limb scales smooth with the exception of the small scales on the dorsal surface of the limbs. Most scales of the pes and manus smooth; if keeled only with a single weak keel.

Tail. Laterally compressed, with a high crest, and with all the scales keeled. Verticils not readily distinguishable.

Measurements. Snout-to-vent, 65 mm.; head, 18 mm.; femoral length, 21 mm.; ear height, 3 mm. Body/femoral ratio = 3.1, and the head/ear ratio = 6.0.

Description of the paratype. The female paratype resembles the type in all respects except the following: all the head scales keeled; both nostrils separated from the rostral by a single scale; supraorbital semicircles separated by a double row of small scales; rostral bordered posteriorly by six scales; mental bordered posteriorly by only two small gulars along a straight margin; tail slightly compressed but without a crest.

Measurements. Snout-to-vent, 46 mm.; head, 13 mm.; femur, 14 mm.; height of ear, 2 mm.

Color. According to the collector, P. J. Darlington, the type had a brown dewlap in life. As preserved, the only distinctive markings are 12 vertical dark bands on the tail that are separated from each other by narrower lighter bands. Each hind limb has six transverse dark bands, and the forelimb shows evidence of about four transverse dark bands. The dorsum (from the nape to the base of the tail) shows five indistinct, dark crossbands. The chin has reticular markings.

The female paratype has the chin covered with dark reticulations that are continuous with the dark vertical marks on the labials. The body shows no discernible pattern.

Remarks. Though morphologically similar to *homolechis* the new species is a very distinctive form. The smooth head scales and brachials set it off from all the other members of the *homolechis* group. It resembles *allogus* in the postmental-mental suture, the long hind limbs, and large ear opening.

P. J. Darlington also collected *homolechis* at Imias, but did not collect any *allogus*. It is therefore possible that *imias* may be the ecological equivalent of *allogus*.

DISCUSSION

Ecology. We have observed *homolechis* and *allogus* in broadleaf forest localities in Pinar del Rio, Camaguey and Oriente. At all of these localities both species proved to have identical perching habits (head down, a few feet from the ground, on tree trunks) but were ecologically separated, *allogus* being restricted to the deeper shaded portions of the forest while *homolechis* was found in the small clearings and paths or in the sparser portions of the forest. In the forest habitat *homolechis* dwells in the filtered sunlight areas rather than in the deep shade (where *allogus* is found) or in the open full sun areas (where *sagrei* is found). This distinction between the species is reflected in the mean body temperature of the species — *homolechis* having a mean body temperature of 31.8°C. in contrast to 29.2°C for *allogus* (Ruibal, 1961).

Our experience with *ahli* in the Sierra de Trinidad leads us to believe that *ahli* resembles *allogus* in its ecology. In the Sierra de Trinidad we succeeded in finding *ahli* only in the deeply

shaded portions of the forest. Our limited experience with *rubribarbus* in the vicinity of Moa indicated that this species may not be as restricted to shade as *allogus*. Most of the specimens of *rubribarbus* were collected in a portion of the hardwood gallery forest that had been partially burned. The specimens of *rubribarbus* were seen on the exposed tree trunks in the clearings.

A. mestrei is apparently a shade-dwelling form like *allogus*. However, it is distinguished from the other species in apparently being restricted to limestone substratum, rather than to tree trunks.

A. homolechis is characterized by a wider tolerance of habitats than the other species mentioned above. It is not restricted to the forests, and in eastern and western Cuba is found associated with *sagrei* in the vicinity of human dwellings.

Distribution. Both maps (Figures 13 and 17) demonstrate distributional gaps of *homolechis* and *allogus* in the region of Matanzas and most of Las Villas. A similar gap occurs in N.W. Oriente where no records of either species are known. We believe that these are apparent gaps and that they are the consequence of two factors:

1. Matanzas and Las Villas are intensively cultivated and the natural forest habitat of these species has been almost completely obliterated. *Allogus* is nowhere known to survive outside of its shade-forest habitat and *homolechis* is only sometimes found outside of the forest. Before the advent of agriculture most of the vegetation of these provinces was hardwood forest and it can be assumed that these two species were then common and widespread in these areas.

2. These areas are poorly collected and if appropriate habitats still exist they have not been visited by herpetological collectors.

It is of interest that similar distributional gaps exist for *A. porcatus* and *A. allisoni* (Ruibal and Williams, 1961).

One question that further collecting in Las Villas may answer is the relation of *ahli* to *allogus*. Our data so far indicate that *ahli* is restricted to the Sierra de Trinidad; however, we have no information whatever about the portions of Las Villas outside of these mountains.

We lack similar information in respect to the zone of contact between *allogus* and *rubribarbus*. If intermediates between these two forms are found along the northern coast of Oriente it would be necessary to reduce *rubribarbus* and *allogus* to subspecies.

The distribution of the various species of this group can be summarized in the following manner:

1. Islandwide distribution. The species sympatric, but ecologically isolated from each other:

homolechis and *allogus*

2. Local species inhabiting restricted areas and occupying an ecological niche comparable to that of *allogus*. These species are all allopatric to *allogus*:

ahli, rubribarbus (?), and *imias* (?)

3. Local species inhabiting restricted areas and occupying an ecological niche comparable to that of *allogus*, differing, however, in the substratum selected for perching. Sympatric with *allogus*:

mestrei

Relationships. The six species of the *homolechis* group are closely related, and as has been mentioned previously some of the forms cannot be adequately distinguished by scale characters. The two most distinctive forms are *allogus* and *homolechis*. The six species can be grouped in the following manner:

allogus *ahli* *rubribarbus*	Very similar, not readily distinguishable except by color.
homolechis *mestrei*	Very similar, not readily distinguishable except by color.
imias	Appears to be closer to *homolechis* than to *allogus*.

Another species which is closely related to these species, and may actually merit being included in the group is *A. sagrei*. So far the only distinguishing character of squamation that we have been able to find to separate *sagrei* from the *homolechis* group (especially *homolechis* itself) is the keeled mucronate condition of the ventral scales in *sagrei*, and this keeling may sometimes be very weak and even apparently absent (e.g. in some specimens from Trinidad, Las Villas). *Sagrei* does, of course, differ from *homolechis* and all other members of the *homolechis* group in dewlap color and in thermal requirements and ecology.

In Table 3 the various characters used in distinguishing species of the *homolechis* group are tabulated to facilitate a comparison of the six forms.

TABLE 3. THE CHARACTERS USED IN DISTINGUISHING THE SPECIES

Characters	*allogus*	*ahli*	*rubribarbus*	*homolechis*	*mestrei*	*imias*
Number of scales separating supraorbital semicircles	2	2	2	1	1	1-2(?)
Posterior medial margins of mentals separated by small postmentals	No	No	No	Yes	Yes	No
Supradigitals and supracarpals multicarinate and mucronate	Yes	Yes	Yes	No	No	No
Number of scales between the first canthals	7-9	7-9	7-9	5-7	5-7	6

	allogus	*ahli*	*rubribarbus*	*homolechis*	*mestrei*	*imias*
Scale anterior to naris divided or single	Divided	Divided	Single	Single	Single	Single
Scales around interparietal large	No	No	No	Yes	Yes	Yes
Average head/ear ratio	6.2	6.3	7.6	7.7	8.5	6.0
Average body/femoral ratio	3.3	3.3	3.3	3.6	3.2	3.1
Iris Color	Blue	Blue	Blue-grey	Yellow	Yellow	?
General body color	Reddish	Brown with greenish cast	Greyish	Brown-black	Grey with greenish cast	?
Dewlap color	Tan or yellowish with 2-4 reddish stripes	Yellowish with a red basal spot	Yellow with 4-5 red stripes and a white border	Variable (See Fig. 12)	Red basal spot with yellow stripes and a broad white margin	Brown

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LIST OF LOCALITIES

A. allogus

PINAR DEL RIO: Sumidero; near Cabezas; 13.5 km. S. of Las Pozas; Rangel; San Vicente; San Diego de los Baños; 8 km. E. of Matahambre; Pinar del Rio; Soroa.

HABANA: 6.8 m. W. of Jaruco.

CAMAGUEY: 15 km. S.W. of Camaguey; nr. Banao, Sierra de Cubitas; S. of Jaronu; Sierra de Najasa; 7 km. S.E. of Sta. Cruz del Sur; Loma de Cunagua.

ORIENTE: Mal Paso, nr. Guantanamo; Monte Libano, nr. Guantanamo; Bueycito; Los Negros, nr. Jiguani; Baracoa; coast S. of Pico Turquino; Cobre Range, Sierra Maestra; Palma Mocha Mts., Sierra Maestra; Banes; Pico Turquino; nr. Buey Arriba; 16 m. E. of Mayari; Jutinicu; mts. N. of Imias.

A. ahli

LAS VILLAS: Electric plant, Sierra de Trinidad; nr. Camanayagua, Sierra de Trinidad; W. slope of Sierra de Trinidad; S. of Topes de Collantes; Habanilla Falls, Sierra de Trinidad; 4 km. W., 12 km. N. of Trinidad.

A. rubribarbus

ORIENTE: nr. Moa; Cananova; Mina Piloto.

A. mestrei

PINAR DEL RIO: San Vicente; 10 km. W. of Cabezas; 10 km. N. of Cabezas; 2.9 km. E. of Isabel Rubio; Soroa; 8 km. E. of Matahambre; Rangel; San Diego de los Baños; Luis Lazo; Sumidero.

A. imias

ORIENTE: Imias.

Anolis homolechis homolechis

(Localities preceded by an asterisk denote yellow dewlap populations)

PINAR DEL RIO: Luis Lazo; Guane; Sumidero; nr. Consolacion del Sur; San Diego de los Baños; San Vicente; N. of San Vicente; nr. Cabezas; Soroa; 7.6 ml. E. Isabel Rubio; 2.9 ml. E. Isabel Rubio; 7-10 km. S.W. of Cayuco; *N. shore Ensenada de Corrientes; *W. coast Cabo Corrientes; 8.5 ml. E. Cabañas; San Cristobal; 1 m. N. of La Coloma; nr. Viñales.

HABANA: 9 km. S.W. San Jose de las Lajas; Playa de Guanabo, E. of Habana; Jibacoa; Isla de Pinos (various localities); Habana, nr. Rancho Boyero; Habana; San Antonio de los Baños; Madruga.

MATANZAS: Pan de Matanzas; 6 km. N.E. of Matanzas; 5 km. N.E. of Canasi.

LAS VILLAS: Topes de Collantes, Sierra de Trinidad; Central Soledad; Sierra de Jatibonico.

CAMAGUEY: 15 km. S.W. of Camaguey; Sierra de Najasa; 27 km. W. of Ciego de Avila; about 15 km. S.W. of Vertientes; 7-8 km. N.E. of Santa Cruz del Sur; *Sierra de Cubitas; *nr. Banao; *Bahia de Nuevitas, San Jacinto; *Bahia de Nuevitas, Los Ballenatos; *Loma de Cunagua, 12 m. E. of Moron; *between Esmeralda and Jaronu; *S. of Jaronu; 0.6 ml. N. of Majagua; Marti: Cuatro Caminos; *Playa Sta. Lucia and a number of localities S.W. of Sta. Lucia.

ORIENTE: Guantanamo; Sagua de Tanamo; Cananova; nr. Moa; 16 km. E. of Mayari; nr. Buey Arriba; Birama; Pico Turquino; *Coast S. of Pico Turquino; Mina Piloto; Buenos Aires; near Santiago; *Banes; *Cabo Maisi; Los Negros, nr. Jiguani; Baracoa; *lower Rio Ovando; Sierra del Cobre; *Cabo Cruz; N. of Imias; Imias; *Playa Juragua, nr. Siboney; *between Belic and Cabo Cruz.

A. homolechis quadriocellifer

PINAR DEL RIO: Ensenada de Cajon; Cabo San Antonio.

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